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NATURAL RESOURCES IN NATIONAL BALANCE SHEETS

This article outlines ABS work on the valuation of natural resources presented within the national balance sheets (Occasional Paper: National Balance Sheets for Australia, Issues and Experimental Estimates 1989 to 1992, (5241.0)). 'Natural resources' in this context covers land, forests, and subsoil assets. The value of natural resources had not previously been included in the Australian national accounts, and the experimental estimates represent the first attempt by the ABS to value consistently a diverse range of Australia's assets. The balance sheets indicate that Australia's net worth rose from $1,580.5b at 30 June 1989 to $1,687.0b at 30 June 1991 (representing annualised growth of 3.4%), before falling to $1,669.4b at 30 June 1992 (representing a fall of 1%).

The article provides a brief description of some of the methodological issues and problems encountered, before presenting a selection of results.

BACKGROUND

Over the last decade there has been a growing awareness (in Australia as well as overseas) of the importance of the environment and a growing demand for environmental statistics to assist research and decision-making. As part of this development, the new international framework for national accounts System of National Accounts 1993 (or SNA93)(a) recommends including natural resource assets in the national balance sheet. The work undertaken by the ABS is in response to these changing demands.

In line with the recommendations of SNA93, the ABS has applied the principle that the valuation of an asset(b) must be related to its ability to earn its owner an income, either immediately or at some definable future date. It should be noted that natural assets, especially forests, may have non-economic values in addition to their commercial values. However, it is not feasible to measure these in a national accounts context.

SNA93 recommends that, where possible, asset valuation should be on the basis of current, observable market prices as this is the basis on which decisions by economic agents (producers, consumers and investors) are made. However, for the most part, there are insufficient data on transactions in natural resources to support this approach. SNA93 recognises this problem and suggests that the net present value approach (NPV) to valuing the future stream of income, may be used as an appropriate conceptual substitute. The NPV represents the present day value of the future income discounted for a time preference. For example, $100 today has a higher value that $100 in one year's time. To derive the NPV of the latter $100 requires that it be discounted by an appropriate rate of interest.

Subsoil assets

Subsoil assets are those resources considered economically exploitable, and include known

deposits of coal, oil and natural gas resources, and metallic and non-metallic mineral resources, including deposits under the sea.

In the Australian context economically exploitable deposits are those that the Bureau of Resource Sciences defines as 'economic demonstrated resources' (EDR), which refers to those resources with a very high degree of geological assurance and for which extraction is expected to be profitable over the life of the mine(c). It approximates both proven and probable resources. It is difficult to value subsoil assets as they have not yet entered the production process. SNA93 recommends that, in the absence of market transactions, the value of resources be determined by the present value of the expected net returns resulting from the commercial exploitation of those assets.

While the total stock of Australia's minerals is unknown, it is important to note that economic demonstrated resources are a small component of the total resource stock.

The ABS approach

The approach taken by the ABS in calculating the NPV of subsoil assets was to take the value of gross output during a twelve month period and to deduct costs (including a 'normal' return on capital) to derive net income. This was taken to be the equivalent of 'economic rent'(d). Cost data include labour, on-site costs, mining and milling costs, and depreciation charges. Exploration costs within the mine lease, plus a 'normal' return on capital, were also included. The 'normal' return on capital used was the Commonwealth government 10-year bond rate, which was multiplied by the net capital stock for the mining industry (using the ABS's capital stock estimates). The return on the capital stock was divided into total extraction costs (costs multiplied by production for each commodity) to determine a mark up to be applied to total costs which represented the 'normal' return to capital. The stream of future net income was calculated for each year, taking into account average annual production and the average mine life. This income stream was then discounted to obtain a value in today's dollars.

The discount rate in theory equates to the weighted average cost of capital, and the rate chosen should represent the cost of the risk in waiting for the cash flow from a project. Risks or uncertainties include, for example, the existence of markets, competition and natural disasters. The longer the lead time, the greater is the risk that expected future cash flows will not eventuate. Other factors which must be considered in setting an appropriate discount rate include the expected inflation rate, and the rate of return available from alternative uses of investment funds. Discounting an uncertain future flow of income embodies a number of assumptions regarding a 'steady state', namely that price, production, interest rates, operating costs and returns to capital will remain unchanged from the year for which the estimates are made until the resource is exhausted. These assumptions are unrealistic, contributing to uncertainty surrounding the estimates. Moreover, the resource life is unknown until the subsoil asset is fully extracted.

Valuation issues
The major drawback of the net present value (NPV) approach for subsoil assets is that the estimates are subject to uncertainty and revision regarding:

- the future price of the commodity;
- the technological developments which will occur during the life of the mine, which may extend its life significantly;
- the true size of the deposit and any nearby deposits, which may be different from the original estimates; and
- the quality of the deposits yet to be found.

Given the way estimates of the value of subsoil assets are derived, only a very small portion of

the total resource is accounted for at any one time; and valuation can give a very misleading impression of the extent of the resource. The point is not that valuation should not be attempted, but rather that the monetary estimates should be used in conjunction with the physical stocks of the resources (bearing in mind that the physical estimates are also subject to some uncertainty). Hence, the estimates must be viewed with some caution. Monetary estimates are subject to considerable volatility and accordingly can give a deceptively optimistic or pessimistic picture, while physical estimates may offer only a very limited view of the resource's full extent.

Land

Land is defined (SNA93, para. 10.121) as the ground itself, including the soil covering and any associated surface water. Excluded are buildings, cultivated flora and fauna, subsoil assets, and non-cultivated biological resources. As land is not created, the only way transactions in land impact on GDP is through the transaction costs associated with purchase and sale, or through improvements (such as clearing).

Land estimates cover the value of freehold and leasehold land in private hands, plus land owned by Commonwealth government business enterprises. Unalienated Crown land, including land potentially subject to Mabo-like claims, has been excluded from the scope of these estimates because of the difficulty in establishing an appropriate value. Also excluded because of the unavailability of data is land held, but not leased out, by State and local government business enterprises. The significance of these exclusions is not known, but it is thought that they do not materially effect the levels, and most certainly have no significant impact on the changes over time in the estimated values.

The estimates were standardised on a consistent basis for each State and Territory and are based on the concept of 'site value'. Site value includes the value of invisible improvements to the land that cannot be separated from it, such as clearing of trees and drainage work, as well as the unimproved capital value of the land itself. This leads to an element of double counting in the balance sheets: expenditure on invisible improvements are recorded as gross fixed capital expenditure on non-dwelling construction in the capital account, as well as being included in the estimate of land (this double count is not considered significant). Estimates of site values were taken from the Coleman Report(e) (1993) to the Commonwealth Government, which was produced to assist the comparison of the relative capacities of the States and the Northern Territory to raise revenues from owners of land and from transactions in land. Land is valued at its approximate current market price.

Using administrative data has certain shortcomings. The data are compiled for use by governments when assessing the potential for raising revenue from land rates and taxes on transactions in land. Their estimation process uses whatever data are available to isolate the value of the land from any capital improvements to the land. This may introduce an element of subjectivity into the data.

Forests

SNA93 does not specify the types of forests which should be included in the national balance sheet. The ABS has chosen to value only the timber value of those forests which are available now, or will be available in the future, for production of timber. Further, as there are too few transactions from which to determine a market value, indirect valuation techniques have been used as a proxy for the economic value of forests. Non-timber values (such as the prevention of soil erosion, and maintenance of bio-diversity) lie outside the presently accepted methods of SNA93.

All publicly owned forests outside conservation reserves and all private forests are potentially available for timber production, although a number of constraints reduce the area of forest that is actually available. For publicly owned forests, the constraints include the accessibility of the resource, the economic feasibility of extracting the resource and the setting aside of specified areas of forests under management codes of practice. National parks, wilderness areas and world heritage listed areas have been excluded from the valuation because logging is prohibited.

The ABS approach

Forests have been broken down into two broad types: native forests (which account for approximately 95% of the area of all forests, including a very small area of broadleaved plantations), and coniferous plantations.

For native forests (including broadleaved plantations) the stream of future income was calculated for each forest age group by State and Territory. The future net income was derived from the size of the forests (number of hectares or thousand trees) multiplied by the yield per hectare (or thousand trees) for sawlogs and pulplogs, with the results being multiplied by the stumpage fees per cubic metre for sawlogs and pulplogs, respectively. Stumpage fees are the payments made to the owner of the resource by the logger for the right to log. They were taken to be the equivalent of economic rent. The values are then discounted over the time to maturity of the forest, assuming current production rates are maintained through the forests' lives. Mature forests were not discounted.

Coniferous plantation forests were valued using an insurance schedule provided by a private insurance company. The schedule shows the value of each hectare of plantation from 1 to 30 years of age as determined by the Australian Forest Growers Association.

Valuation issues

At present, there are no comprehensive data sources to provide annual estimates of the total area of forest available for timber production. However, the survey by the Resource Assessment Commission found that 22.1 million hectares of native forest were available for logging in 1990(f). In addition, data from the Australian Bureau of Agricultural and Resource Economics (ABARE) indicate that there were just over one million hectares of plantation forest, comprising broadleaved and coniferous forests.

Stumpage fees are being used as a proxy for economic rent. However, the stumpage fees may include non-rent components, such as service costs for road maintenance, and the stumpage fee itself is subject to variation according to such factors as straightness, location and log size.

Any income received from thinnings was also ignored, which results in an underestimate of net income.

Finally, the values for forests presented in the balance sheets have been calculated for their timber values only, but it should be noted that forests have other non-economic values, many of which are in conflict with their usual economic activity (namely logging). Placing a non-timber value on forests is very difficult and highly contentious. Even though there are clear economic benefits from the existence of forests there is no satisfactory method of assigning dollar values to these benefits.

Data

The table shows the balance sheet estimates of natural resources in their most aggregated form.

S5.1 BALANCE SHEET ESTIMATES FOR AUSTRALIA

	30 June 1989 $b	30 June 1990 $b	30 June 1991 $b	30 June 1992 $b
Land	541.7	533.1	544.8	508.7
Native forests	8.3	8.7	8.8	8.8
Plantation forests	4.8	5.4	6.2	6.4
Subsoil assets	109.1	115.6	135.5	145.2
Total non-financial assets(a)	1,731.0	1,810.7	1,876.2	1,869.5
less liabilities to non-residents (net)	150.5	168.7	189.2	200.1
Net worth	1,580.5	1,642.0	1,687.0	1,669.4

(a) Total assets includes produced assets (fixed assets, inventories) not shown separately in the table.

Source: Occasional Paper: National Balance Sheets for Australia, Issues and Experimental Estimates 1989 to 1992 (5241.0).

At 30 June 1992, the total value of land in Australia was estimated to be $509b, which represents a fall of almost 7% on the previous year's estimate. In value terms subsoil assets are the next largest, and are estimated to have grown during each year of the period 30 June 1989 to 30 June 1992. Although native forests represent many times the area of plantation forests, they are estimated as having (in absolute terms) little difference in value. The value of native forests has been stable during the period in nominal terms, while that of plantation forests has grown steadily.

Both total non-financial assets and net worth peaked at 30 June 1991, with the fall in the land estimates over the next twelve months causing the consequent drop in both series. 'Natural resources' (defined to include only those presented in the table) account for just under 40% of total non-financial assets throughout the period, with produced assets representing just over 60%. Liabilities to non-residents make a negative contribution (reducing total assets) and account for approximately 10% of net worth throughout the period.

Conclusion

This article has briefly outlined the approach taken by the ABS when constructing the national

balance sheet, and identified some of the issues related to the valuation of subsoil assets, land and forests. The results should be interpreted with care as there are still many conceptual and data issues to be resolved. Readers are invited to contact: Director, National Accounts Research Section, ABS, PO Box 10, Belconnen, ACT 2616 with any comments or queries.

Endnotes

(a) The SNA is being widely adopted by government statistical agencies throughout the world, including the ABS, as the conceptual basis for compiling their national accounts.

(b) For an asset to be included in the national balance sheets, SNA93 states that it must fulfill certain criteria.

'The assets recorded in the balance sheets of the System are economic assets. These are defined as entities:

- over which ownership rights are enforced by institutional (economic) units, individually or collectively;
- rom which economic benefits may be derived by their owners by holding them, or using them, over a period of time.' (SNA 93 para. 10.2)

The economic benefits consist of income derived from the use of the asset and the value, including possible holding gains/losses, that could be realised by disposing of the asset or, in the case of a financial asset, by extinguishing it.

(c) The BRS has adapted the McKelvey Box to cross-classify Australian subsoil assets by the degree of economic feasibility and geological assurance of the deposit.

(d) Economic rent is the return to the owner of the resource for use of that resource, but excludes the costs necessary to replace it. Originally applied to land, it is now generally applied as the return to the owners of any natural resource.

(e) Coleman, M.R., Report on Land Valuation Data, Commonwealth Grants Commission Report on the General Revenue Grant Relativities 1993, Volume 3, Appendixes, July 1993.

(f) Resource Assessment Commission, Forest and Timber Inquiry Final Report, Volumes 1, 2A and 2B, March 1992, RAC, Canberra.

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